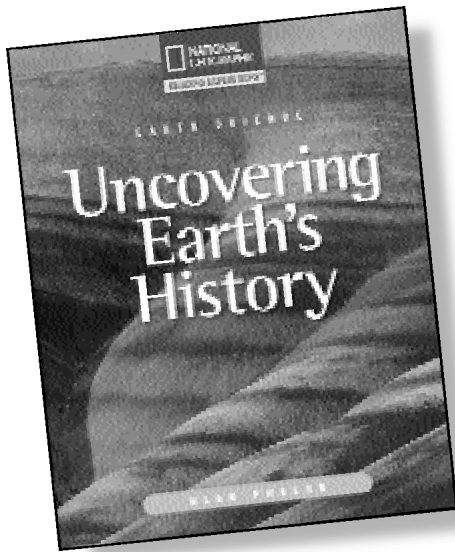


## Overview

### Summary

# Uncovering Earth's History



By Glen Phelan

Over time, Earth and Earth's life forms have changed in many ways. Geologists are among the scientists who study these changes. They study solid parts of Earth, the parts such as rocks and fossils that provide clues to Earth's past. Fossils and rocks can tell about climate changes, mammals, insects, and plants of long ago. Scientists think that Earth experienced an Ice Age about 2 million years ago. Though dinosaurs had already been extinct for about 65 million years, giant mammals roamed Earth at the time. Near the end of that Ice Age, humans lived on Earth, and the giant mammals became extinct. They have many theories, but scientists aren't sure why these giant mammals died out. Scientists use many methods, such as radiocarbon dating and electron spin resonance (ESR)

to date fossils. Each fossil helps scientists learn more, and new technologies will help scientists dig even deeper into the history of life on Earth.

### Science Background

Clues to the natural history of Earth are all around us. The clues are in the landscape—from the layers of rock exposed in the mile-deep Grand Canyon to the soil banks exposed along a creek and from skeletons of woolly mammoths to tiny fossils in stones along the roadside. The history of Earth is constantly written and revised as new discoveries unfold. But discovering any part of Earth's history is not confined to professionals. Armed with a few guiding principles, any person can step outside and begin “reading” the landscape and uncovering the secrets to Earth's past.

## Learning Objectives

### Science

- Recognize that the surface of Earth changes over time
- Recognize that many organisms that lived long ago are extinct
- Identify hypotheses that explain the extinction of Ice Age mammals
- Explain how fossils provide evidence about how life and environmental conditions have changed
- Identify techniques and tools used by scientists to determine the age of rocks and fossils

### Process Skills

- Skill Focus**
- Defining operationally
- Supporting Skills**
- Communicating
  - Collecting data
  - Investigating
  - Predicting
  - Making a graph

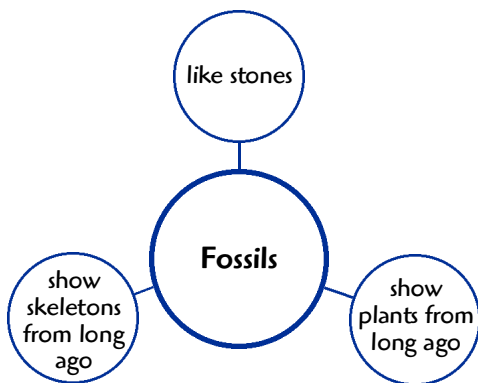
### Reading Skills

- Genre: Expository**
- Skill Focus**
- Distinguish fact from opinion
  - Relate words
- Supporting Skills**
- Recognize cause-and-effect relationships
  - Retell
  - Summarize

## Before Reading

### Activate Prior Knowledge

Ask students to begin a web that helps describe fossils. Have them write *Fossils* in the center and then write words that describe fossils or examples of fossils in the circles around the center. (See the sample web below.) Small groups of students may work on individual webs together. They can add to their webs as they read and study *Uncovering Earth's History*. As students read, have them think about how people learn about the Earth and how the Earth has changed over time.



### Preview

Give students time to flip through the book, paying attention to chapter titles, photos, captions, and diagrams. Ask:

*After reading chapter heads and subheads, can you predict what topics will be included in this book?*

*Look at the diagram on pages 10–11. What kind of information does this diagram provide? How do you know?*

*Why are some words, like “Ice Age” on page 15, in bold?*

*What information do sidebars provide?*

### Set Purpose

Ask students whether this book reminds them of other books they have read. Ask:

*Why do you think we’ll be reading this book?*

Encourage students to give reasons for their answers. Model your own purpose for reading, such as *I want to read to find out about the Ice Age.*

### Vocabulary Strategy: Relate Words

#### Activity Master, Page 46

Direct students’ attention to the cover of the student book. Point out the title and ask students to describe the image shown. Ask them to suggest reasons why this image was chosen for the student book’s cover. Lead students to recognize that fossils are one type of evidence scientists use to “uncover” or learn more about Earth’s history. Explain that the vocabulary words they will be working with today all relate to understanding Earth’s history. Have students use the student book, the glossary, and a dictionary to write how each word relates to understanding Earth’s history. Students will be using these words:

geologist	glacier
radiocarbon dating	Ice Age
sedimentary rock	extinct

## Correlation to National Standards

### Writing Skills

- Writing Focus**
- Write a story (narrative)
- Supporting Skills**
- Prewrite
  - Conduct research
- Viewing**
- Read aloud

### Science

- Scientific inquiry (K–4, 5–8)
- Science and technology (K–4, 5–8)
- Science as a human endeavor (K–4, 5–8)
- Properties of Earth materials (K–4)
- Changes in the Earth and sky (K–4)
- Organisms and their environments (K–4)
- Diversity and adaptations of organisms (5–8)
- Earth’s history (5–8)

### Reading/Language Arts

- Read to build an understanding of Earth’s history
- Apply a wide range of strategies to comprehend and interpret texts
- Use the writing process
- Conduct research
- Use spoken and written language for learning
- Use a variety of informational resources

## During Reading

### **Read Strategically: Distinguish Fact from Opinion**

**Activity Master, Page 47**

Assign each chapter of the book as independent reading. Have students use the Activity Master on page 47 as a study guide to help them distinguish facts from opinions. As students read, they write facts and their own opinions about various topics related to Earth's history. Students use details from the book to support their opinions. Remind students that statements of fact can be proven to be true or false. Statements of opinions describe beliefs or feelings. Opinions often begin with phrases such as "I believe that. . ." or "I think . . ."

#### **Strategy Tip: Summarize**

To help clarify understanding as they read, suggest that students silently summarize what they've read following each section. They should ask themselves, "What do I know now about the Ice Age? What are some theories about why giant mammals became extinct?"



### **Meeting Individual Needs**

For specific strategies on meeting individual needs, see pages 50–55.

## After Reading

### **Responding**

Initiate a class discussion to assess reading comprehension. Ask:

*What are fossils and why are they important to studying Earth? (See pages 5 and 11–12 in the student book.)*

**(cause and effect)**

*What are two ways Earth's surface has changed over time? What causes these changes? (See pages 7–9.)*

**(cause and effect)**

*What kinds of clues do fossils provide? (See pages 11–12 and 22–23.)*

**(retell)**

*What is the Ice Age? (See page 15.)*

**(retell)**

*How was life during the Ice Age different from life on Earth today? (See pages 15–16.)*

**(compare and contrast)**

*Why do you think the giant mammals became extinct? (See pages 16–18.)*

**(fact and opinion)**

*What are some tools and techniques used by scientists to learn about Earth's history? (See pages 20–23.)*

**(summarize)**

### **Writing and Research: Write a Story**

**Activity Master, Page 48**

Ask students to work with partners to create a story that takes place during the Ice Age. The stories should include some of the facts they have learned about giant mammals, one extinction theory, the environment, and what life may have been like for the humans who lived during this time period. The Activity Master on page 48 will help students organize ideas for their stories.

### **Communicating: Speaking/Listening**

#### **Read stories aloud**

Students can read their stories aloud in small groups.

Students reading aloud should

- ✓ speak clearly and with expression
- ✓ make eye contact with listeners

Listeners should

- ✓ listen politely
- ✓ ask questions to clarify the plot
- ✓ listen for facts related to the Ice Age

## Focus on Science

### Thinking Like a Scientist

**Process Skill: Defining Operationally**  
*Answers for page 12: Answers will vary for definitions, but definitions might include words such as “protect” or “make safe.”*

*Answers for page 27: 1. The layers have tilted 2. The layers have tilted up and erosion has worn them down. 3. how the rock formations began 4. a space of younger rock separated from older rock*

*Check It Out: something unwanted or unexpected*

### Defining Operationally

#### Activity Master, Page 49

Students use the Activity Master on page 49 to operationally define terms.

*Answers for Activity Master, page 49: Operational and dictionary definitions will vary. Operational definitions may be easier to understand.*

## Hands-on Science

**Summary** Students use pennies, a shoebox and graph paper to model the process of radiocarbon dating.

**Tips** Make sure students understand that the pennies represent atoms of carbon-14 and the box represents an animal that has died. You might want to complete Steps 3 through 5 as a class to make

sure students enter information into the graph correctly.

**Answers to Think** *About half the pennies remained after each half-life; 17,190 ( $5,730 \times 3 = 17,190$ ); about 6 pennies*

## Assessment Options

Use the following assessment options to assess students’ understanding of *Uncovering Earth’s History*.

### Questions

Use the following questions during individual conferences, or ask students to write the answers in their notebooks:

- 1 What can fossils tell us about Earth’s history?
- 2 Name two ways Earth’s surface has changed over time and identify what caused these changes.
- 3 What are three facts about the Ice Age?
- 4 Describe two theories that explain why giant mammals became extinct.
- 5 What is radiocarbon dating and what is it used for?

### Assessment Activity

Students can create part of a museum exhibit related to Earth’s history. They choose one topic from the list provided below and then create a diorama, a poster, or a model to communicate their knowledge. Students should also write a title and a paragraph that summarizes the important ideas.

Topics to choose from

- Scientists know that Earth’s surface has changed over time.
- Fossils can tell us about Earth’s history.
- Earth has had an Ice Age.
- Scientists have different techniques for understanding Earth’s history.

Exhibit projects should

- ✓ clearly address three important ideas related to the topic
- ✓ use both words and images to communicate ideas
- ✓ be well organized and carefully prepared
- ✓ use correct grammar and mechanics

### Multiple-Choice Test

Use the multiple-choice test on page 69.

## Cross-Curricular Connection

### Mathematics

Suggest that students compare measurements of a giant mammal to measurements of a similar mammal alive today. Students can conduct research to find measurements and create a simple diagram. Giant mammals to research include:

woolly rhinoceroses    large wolves  
giant deer                    saber-toothed cat

## Home-School Connection

Students and parents can rent a video or DVD that features topics related to Earth’s history. Ask students to talk about how the information compares to what they learned in *Uncovering Earth’s History*.

## Vocabulary: Relate Words

The words below are from *Uncovering Earth's History*. Each word has something to do with Earth's history. Use the glossary of the student book to check your understanding of each word. Then write a sentence for each word that shows how you think it relates to Earth's history.

Word	Meaning	My Sentence
geologist		
radiocarbon dating		
sedimentary rock		
glacier		
Ice Age		
extinct		

**Reading: Distinguish Fact from Opinion**

In *Uncovering Earth's History*, you will read about how Earth has changed over time and how scientists learn about these changes. For each topic below, write one fact and one opinion. Use the student book to find information to help you write statements of fact and opinions.

Remember that a statement of fact can be proved true or false. An opinion describes feelings or beliefs about something. An opinion cannot be proved true or false, but a valid opinion needs details to support it.

**Topic: Geologists**

Fact \_\_\_\_\_

Opinion \_\_\_\_\_

\_\_\_\_\_

**Topic: Fossils**

Fact \_\_\_\_\_

Opinion \_\_\_\_\_

\_\_\_\_\_

**Topic: The Ice Age**

Fact \_\_\_\_\_

Opinion \_\_\_\_\_

\_\_\_\_\_

**Topic: Extinction theories**

Fact \_\_\_\_\_

Opinion \_\_\_\_\_

\_\_\_\_\_

**Topic: Tools and techniques for dating fossils and rocks**

Fact \_\_\_\_\_

Opinion \_\_\_\_\_

\_\_\_\_\_

**Writing: Prewriting****Write a Story**

You will be writing a story that takes place during the Ice Age. How will your characters survive in the Ice Age? What will happen? You can use the student book and other resources to find information about the Ice Age. Plan your story below.

**1. What will the land and weather be like?**

---

---

**2. What characters will be in my story?**

---

---

**3. How do these characters dress, eat, and find shelter?**

---

---

**4. What mammals will be included?**

---

---

**5. What problem will the characters have? How will they solve their problem?**

---

---

**6. How will my story end?**

---

---

Other topics to include:

tools \_\_\_\_\_

events related to one extinction theory \_\_\_\_\_

**Thinking Like a Scientist: Defining Operationally**

Study the pictures and diagrams in *Uncovering Earth's History*. Use the pictures to write operational definitions of the following terms. Then look up in a dictionary and write the dictionary definition. Compare the two definitions.

**1. glacier**Operational definition: \_\_\_\_\_  
\_\_\_\_\_Dictionary definition: \_\_\_\_\_  
\_\_\_\_\_Comparison \_\_\_\_\_  
\_\_\_\_\_**2. fossil**Operational definition: \_\_\_\_\_  
\_\_\_\_\_Dictionary definition: \_\_\_\_\_  
\_\_\_\_\_Comparison \_\_\_\_\_  
\_\_\_\_\_**3. erosion**Operational definition: \_\_\_\_\_  
\_\_\_\_\_Dictionary definition: \_\_\_\_\_  
\_\_\_\_\_Comparison \_\_\_\_\_  
\_\_\_\_\_